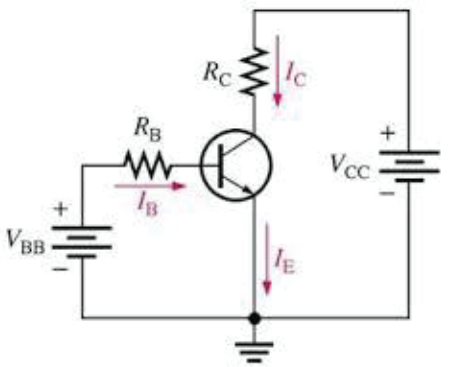
8. Which of the following is applicable in respct to a P-N junction diode, which is not connected to any circuit?

- A: The potential is the same everywhere.
- B: P-type side is at a higher potential than N-type side.
- C: There is an electric field at the junction directed from N-type side to P-type side.
- D: There is an electric field at the junction directed from P-type side to N-type side.

9. Which of the statement is true regarding the NPN transistor in the figure below?



(a) *npn*

- A: $I_C < I_B < I_E$
- B: $I_B < I_C < I_E$
- C: $I_B < I_E < I_C$
- D: $I_E < I_C < I_B$

10. NOR function is the complement of?

- A: AND
- B: OR
- C: XNOR
- D: XOR

11. Which of the following statement is true about operational amplifiers?

They have very high input resistance

They have very low output resistance

Current flowing between two input terminals is zero.

- A: I only
- B: II only
- C: I & III only.
- D: I, II and III.

12. For normal operation of the transistor?

- A: Emitter Base junction and Collector Base junction both are reverse biased.
- B: Emitter Base junction is reverse biased and Collector Base junction is forward biased.
- C: Emitter Base junction and Collector Base junction both are forward biased.
- D: Emitter Base junction is forward biased and Collector Base junction is reverse biased.

13. As the voltage is increased In the reverse bias, the current? (assume functioning prior to the breaking point).

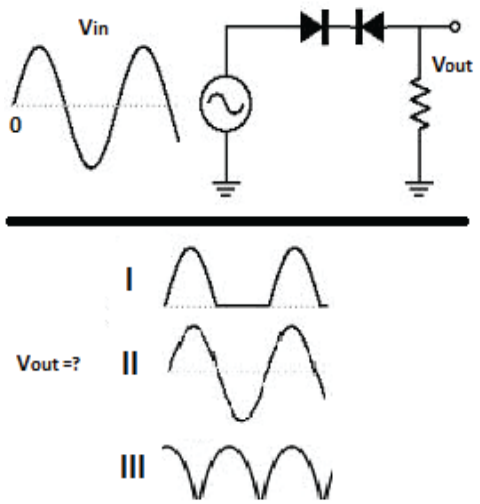
- A: Increases
- B: Decreases
- C: Remains constant
- D: Increase at a constant rate.

14. The truth table below is for which kind of gate?

A	B	Output
0	0	1
1	0	1
0	1	1
1	1	0

- A: AND gate
- B: NAND gate
- C: OR gate
- D: NOR gate

15. In the figure given below, the out put wave for V_{out} would be?

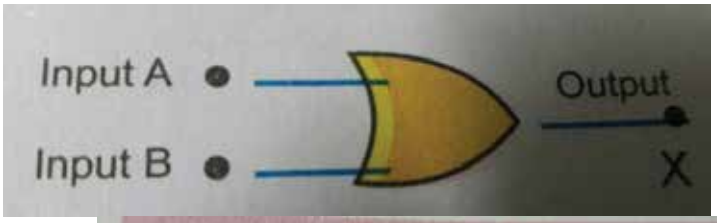


- A: I
- B: II
- C: III
- D: None of the above.

16. A P-N junction diode is said to be forward biased, when?

- A: no potential difference is applied across P and N region
- B: a potential difference is applied across P and N region making P region positive and N region negative
- C: a potential difference is applied across P and N region making P region negative and N region positive
- D: a magnetic field is applied in the region of junction

17. **Which one of the following is the truth table for following gate?**



A:

Table 18.6

A	B	Output
0	0	1
0	1	1
1	0	1
1	1	0

B:

A	B	Output
0	0	0
0	1	0
1	0	0
1	1	1

C:

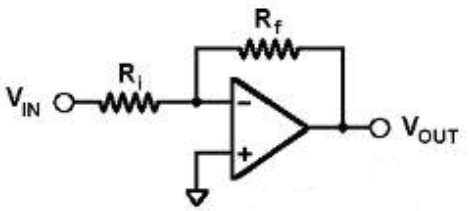
A	B	Output
0	0	0
0	1	1
1	0	1
1	1	1

D: None of the above

18. If change in potential difference in a forward biased diode is 4 V and change in curren is 2 A. The forward resistance is?

- A: 8 ohm
- B: 16 ohm
- C: 2 ohms
- D: 1 ohm

19. If V_{out} is 10 V, R_f = 150 K ohms and R_i = 50 k ohms. What is the gain for the op-amp given below?



- A: Need information about V_{in} to find the gain.
- B: 3
- C: - 3
- D: 200

20. Electrical conductivity of the semiconductors is?

- A: Same as that of metals.
- B: Higher than that of metals.
- C: Lower than that of metals.
- D: None of the above.

MODERN PHYSICS

TEST-1

1. **In Davison – Germer experiment, the diffracted proton from crystal shows _____?**
   - A: Particle property
   - B: Wave property
   - C: Quantum property
   - D: Both B and C

2. **A photon of wave length 100mm behaves like a particle of mass _____?**
   - A: 0 kg
   - B: 5.53×10^{-36} kg
   - C: 3.28×10^{-24} kg
   - D: 2.21×10^{-41} kg

3. **The reverse process of pair-production is?**
   - A: Annihilation
   - B: Fission
   - C: Fusion
   - D: Materialization.

4. **Bones absorb greater amount of incident Xrays. This is because of the fact that**
   - A: Bones lie below flesh
   - B: Bones are light in color
   - C: Bones contain material of low densities
   - D: Bones contain material of high densities

5. **A photon can eject an electron from the surface of a photovoltaic metal if and only if**
   - A: the frequency of the photon is above the activation minimum.
   - B: the wavelength of the photon is above the activation minimum.
   - C: the speed of the photon is above an activation minimum.
   - D: the momentum of the photon is below the activation minimum.

6. **Minimum photon energy for pair production is?**
   - A: 0.25 MeV
   - B: 0.51 MeV
   - C: 1.02 MeV
   - D: 2.04 MeV

7. Cobalt 60 is used in medicine and is an intense source of

- A: Neutrons
- B: α-particle
- C: β-particle
- D: γ-rays

8. As per special theory of relativity which of the following is not an absolute quantity.

Time

Length

Mass

- A: I and II only
- B: I and III only
- C: II and III only
- D: I, II and III

9. Object A, B and C are moving with velocity 0.7c, 0.8c and 0.9c in parallel to a meter rod. Which of these would see the highest contraction is length?

- A: A
- B: B
- C: C
- D: All would observe same length.

10. Which of the following is not an inertial frame of reference?

- A: Earth
- B: Geostationary satellite.
- C: Accelerating train.
- D: Car moving with uniform velocity.

11. Stopping potential for a metal surface incase of photo electric emission depends on?

- A: The threshold frequency for the metal surface.
- B: The intensity of incident light
- C: The frequency of incident light
- D: None of these

12. Which of the following is correct about the photo electric current?

- A: Current is proportional to the frequency of light.
- B: Maximum kinetic energy is proportional to the frequency of light.
- C: Increasing light intensity increases the kinetic energy of the photons.
- D: Both A & C.

13. Quantum theory states that energy of each particle is proportional to?

- A: Wavelength.
- B: Frequency
- C: Planks constant.
- D: Both B & C

14. The high energy electrons penetrate the specimen to reasonable thickness and acquire sufficient energy due to it's?

- A: Short wavelength.
- B: Long wavelength.
- C: Extremely short wavelength.
- D: None of the above.

15. Mass m of an object moving with velocity 0.8c is?

- A: 0.8 m_0
- B: 1.3 m_0
- C: 1.6 m_0
- D: 2.4 m_0

16. The velocity of particle of mass m of de-Broglie wave length λ is _____?

- A: $2h / m\lambda$
- B: mc / h
- C: hc^2 / λ
- D: $h / m\lambda$

17. Select an alternative form of uncertainty principle from the following?

- A: h/mc
- B: $\Delta E.\Delta T \sim h$
- C: $mc^2 = hf$
- D: Any of the above

18. Which of the following statement is true about a black body?

- A: It is an ideal absorber of radiation but non ideal emitter of radiation.
- B: It is an ideal emitter of radiation but non ideal absorber of radiation.
- C: It is an ideal absorber of radiation and ideal emitter of radiation.
- D: It is a non ideal absorber of radiation and non ideal emitter of radiation.

19. In Compton Effect, which law/laws are conserved?

- A: Conservation of energy.
- B: Conservation of momentum.
- C: Both A & B.
- D: None of the above.

20. An increase in temperature has what effect on the radiation?

- A: It becomes richer in shorter wavelengths.
- B: It becomes richer in longer wavelengths.
- C: Temperature has no effect on radiation wavelength.
- D: Radiation wavelengths follow a bell curve with increase in temperature.

TEST-2

1. **Helium-Neon lasers are used for:**

   - A: Precision measurement of range finding
   - B: Welding detached bone of a body
   - C: Optical fibre communication systems
   - D: Surveying for construction of tunnels

2. **A blackbody at temperature 17 centigrade shall radiate most energy at the wavelength of? Wien's constant = 2.9 * 10^{-3} mK.**

   - A: 1 μm
   - B: 10 μm
   - C: 17 μm
   - D: 170 μm

3. **Which of the following is Stephen's constant?**

   - A: $\lambda_{max} * T = 2.9 * 10^{-3}$ Mk
   - B: $h = 6.63 * 10^{-34}$ Js
   - C: $c = 3 * 10^{8}$ m/s
   - D: $\sigma = 5.67 * 10^{-8}$ $Wm^{-2}K^{-4}$

4. **What is the type of characteristic X-ray photon whose energy is given by relation '$hf=E_M-E_K$'?**

   - A: K-alpha
   - B: M-alpha
   - C: K-beta
   - D: M-beta

5. **What is the energy of each photon released in the annihilation of electron and positron?**

   - A: 1.02 MeV
   - B: 2.04 MeV
   - C: 4.08 MeV
   - D: None of the above.

6. **Which of the following statement is true about two postulates of special theory of relativity?**

   Laws of physics are same in all inertial frame of references.

   Speed of light is constant and independent of the relative motion.

   Speed of light is constant but for objects moving with speed closes to c.

   - A: I and II
   - B: I only
   - C: II and III
   - D: III only.

7. **Sodium-24 has half life of 15 hours and it is used to estimate :**

   - A: Kidney function
   - B: Plasma blood volume
   - C: Iron in plasma
   - D: Thyroid function

8. **What will be the relation for the speed of electron accelerated towards the target in X-ray tube by applying potential difference 'V'; take mass of electron 'm' and charge on electron 'e'?**

- A: $v=(2Ve/m)^{1/2}$
- B: $v=(2V/me)^{1/2}$
- C: $v=(2me/V)^{1/2}$
- D: $v=(2Vem)^{1/2}$

9. **Plank's theory holds good for?**

- A: Shorter wavelengths.
- B: Larger wavelengths.
- C: All wavelengths.
- D: None of the above.

10. **The equations of pair production are?**

- A: $hf = 2m_oc^2 – KE(e^-) + K.E\ (e^+)$
- B: $hf = 2m_oc^2 + KE(e^-) + K.E\ (e^+)$
- C: $hf = 2m_oc^2 - KE(e^-) - K.E\ (e^+)$
- D: $hf = 2m_o^2c + KE(e^-) + K.E\ (e^+)$

11. **If the wave length of incident radiation is decreased in photo emission, then _____?**

- A: The minimum kinetic energy of the photo electrons increase
- B: The minimum kinetic energy of the photoelectrons decrease
- C: The average kinetic of the photoelectrons decrease
- D: The maximum kinetic energy of the photoelectrons increase

12. **In a photo electronic effect, monochromatic light, is incident on a metal surface. If the incident light of twice the intensity but the same wave length, the kinetic energy of the emitted electron _____?**

- A: Becomes double.
- B: Remains same.
- C: Becomes half.
- D: First increase then decreases because of curvilinear graph.

13. **If work function is 4.14ev, the threshold frequency of incident light is ?**

- A: 10^{12} Hz.
- B: 10^{13} Hz.
- C: 10^{14} Hz.
- D: 10^{15} Hz.

14. **During the production of LASER,when the excited state E_2contains more number of atoms than the ground state E_1,the state is known as:**

- A: Population inversion
- B: Ground state
- C: Excited state
- D: Metastable state

15. Which one of the following has the largest energy content?

- A: Photons of wavelength 2pm (Y-rays)
- B: Photons of wavelength 1mm (X-rays)
- C: Photons of wavelength 50mm (Infrared)
- D: Photons of wavelength 200mm (UV)

16. Which of the following is correct relationship between the momentum and wavelength of photons?

- A: $P = h * \lambda$
- B: $P = h * \lambda / c$
- C: $P = h / \lambda$
- D: $P = h * c / \lambda$

17. In electron microscope, electric and magnetic field are used as _____?

- A: Electromagnetic gun
- B: Source of electromagnetic waves
- C: Deflected charged particle
- D: Converging source of electrons

18. Helium-Neon lasers are used for:

- A: Precision measurement of range finding
- B: Welding detached bone of a body
- C: Optical fibre communication systems
- D: Surveying for construction of tunnels

19. A photon of energy 4 eV is incident on a metal surface whose work function is 2 eV. The minimum reverse potential to be applied for stopping the emission of electrons, is ?

- A: 2 V
- B: 4 V
- C: 6 V
- D: 8 V

20. Which of the following is the practical application of Xrays?

- A: MRI
- B: Ultrasonography
- C: Computerized Axial Topography
- D: Positron Emission Technology

TEST-3

1. **When a light of wavelength 300 nm falls on a photoelectric emitter (A), the photoelectrons are liberated. For another emitter (B), the light of wavelength 600 nm is sufficient for liberating photoelectrons. The ratio of the work function of the two emitters A : B, is?**

- A: 2 : 1
- B: 1 : 2
- C: 4 : 1
- D: 1 : 4

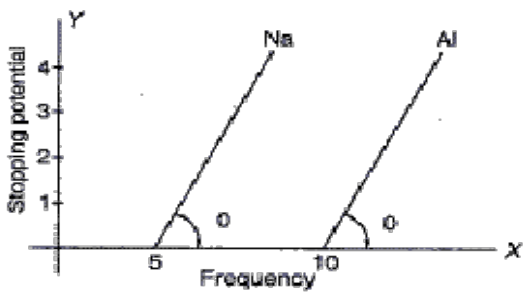
2. **Photons of energy 6 eV, are incident on a surface of work function 2.1 eV. What will be the stopping potential?**

- A: -1.9 V
- B: -3.9 V
- C: -5.0 V
- D: -8.3 V

3. **A photosensitive metallic surface has work function, h v_0. If photons of energy 2 hv_0 fall on this surface, the electrons come out with a maximum velocity of 4 x 10^6 m/s. When the photon energy is increased to 5 hv_0, the maximum velocity of photoelectrons will be?**

- A: 2 x 10^6 m/s
- B: 2 x 10^7 m/s
- C: 8 x 10^4 m/s
- D: 8 x 10^6 m/s

4. **From the figure, describing photoelectric effect, we may infer correctly that?**



- A: Na and Al both have the same threshold frequency.
- B: Maximum kinetic energy for both the metals depend linearly on the frequency.
- C: The stopping potentials are different for Na and Al for the same change in frequency.
- D: Al is a better photosensitive material than Na.

5. **Life time of an electron in energized state is 10^{-10}s. What is the uncertainity in energy during this time?**

- A: 6.63 * 10^{-24} J
- B: 6.63 * 10^{-44} J
- C: 1.05 * 10^{-24} J
- D: 1.05 * 10^{-44} J

6. **The mass of an object will be doubled at speed?**

- A: $(0.25)^{-2}$ * c
- B: $(0.40)^{-2}$ * c
- C: $(0.65)^{-2}$ * c
- D: $(0.75)^{-2}$ * c

7. The radiation emitted by human body lies in the range of ?

- A: Infrared region
- B: Visible region
- C: UV region
- D: None of the above.

8. If energy of photon is 5 MeV. Kinetic energy of particles after pair production is?

- A: 4 MeV
- B: 5 MeV
- C: 6 MeV
- D: Not enough information given.

9. As temperature increases λ_{max} for a black body?

- A: Moves towards shorter wavelengths.
- B: Move towards longer wavelengths.
- C: T has no effect on λ_{max}
- D: None of the above.

10. What is the de Broglie wavelength of a particle of mass 2 mg moving with speed of 1 m/s.

- A: $1.2 * 10^{-28}$ m
- B: $2.8 * 10^{-28}$ m
- C: $3.3 * 10^{-28}$ m
- D: $4.6 * 10^{-28}$ m

11. X-rays from a given X-ray tube operating under specified conditions have a minimum wavelength. The value of this minimum wavelength could be reduced by:

- A: Cooling the target
- B: Increasing the potential difference between the cathode and the target
- C: Reducing the temperature of the filament
- D: Reducing the pressure in the tube

12. Two identical photocathode's receive light of frequencies, f_1 and f_2 . If the velocities of the photoelectrons (of mass m) coming out are v_1 and v_2 respectively , then?

- A: $v_1^2 - v_2^2 = \frac{2h}{m}(f_1 - f_2)$
- B: $v_1^2 - v_2^2 = \frac{2h}{m}(f_1 - f_2)^2$
- C: $v_1^2 - v_2^2 = (\frac{2h}{m}f_1 - f_2)^2$
- D: None of the above.

13. Kg mass will be equivalent to?

- A: 0.25 GWh
- B: 2.5 GWh
- C: 25 GWh
- D: 250 GWh

14. After traveling through a vacuum, a photon of light entering into some transparent denser medium. The energy of photon?

- A: Remains same
- B: Decease because speed decrease
- C: Increase because wave light decrease
- D: Increase and then decrease

15. An observer shoots perpendicular to a meter stick at very high speed (relativistic) and finds that the length of meter stick is?

- A: Greater than one meter.
- B: Less than one meter.
- C: One meter.
- D: None of the above.

16. The work function of a substance is 4.0 eV. The longest wavelength of light that can cause photo electron emission from this substance is approximately?

- A: 540 nm
- B: 400 nm
- C: 310 nm
- D: 220 nm

17. A photon of energy 8 eV is incident on metal surface of threshold frequency 1.6×10^{15}Hz. The kinetic energy of the photoelectrons emitted (in eV) is (Take $h = 6 \times 10^{-34}$ Js)?

- A: 1 eV
- B: 2 eV
- C: 3 eV
- D: 4 eV

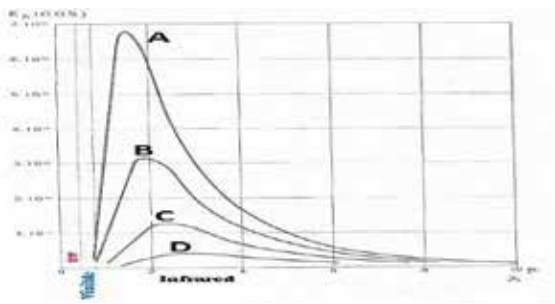
18. Which of the following is most easily detected as quantum radiation?

- A: Radio waves
- B: Infra-red
- C: Ultra violet
- D: Gamma Rays.

19. Photo electric effect for visible light can be obtained from?

- A: Sodium – Potassium
- B: Carbon – oxygen
- C: Helium – Neon
- D: None

20. The graph shows the intensity radiated against wavelength for a black body at different temperatures. Which of the following curve shows the energy radiated at highest temperature?



- A: A
- B: B
- C: C
- D: D

TEST-4

1. **There are n_1 photons of frequency v_1 in a beam of light. In an equally energetic beam, there are n_2 photons of frequency v_2 . The correct relation is?**

   - A: $n_1 / n_2 = v_1 / v_2$
   - B: $n_1 / n_2 = 1$
   - C: $n_1 / n_2 = v_2 / v_1$
   - D: $n_1 / n_2 = (v_1 / v_2)^2$

2. **If electrons of charge "e" moving with velocity "v" are associated through a potential difference "V" and strike a metal target, then velocity of electron is :**

   - A: Ve/m
   - B: $\sqrt{Ve/m}$
   - C: $\sqrt{Ve/2m}$
   - D: $\sqrt{2Ve/m}$

3. **The uncertainty in momentum and position of a particle is due to its _____?**

   - A: Property of matter and radiation
   - B: Two dimensional motions
   - C: Emotion of certain wave length
   - D: Very high velocity

4. **If n number of photon is striking on a metal surface, then the total momentum exerted is _____?**

   - A: nh / λ
   - B: $2nh / \lambda$
   - C: Zero
   - D: $nh\lambda$

5. **Time dialation of 3s oscillation for an observing object moving with velocity 0.95c is?**

   - A: 4.2s
   - B: 5.8s
   - C: 6.4s
   - D: 9.6s

6. **If light enters a denser medium, its speed?**

   - A: Decreases,
   - B: Increases.
   - C: Remains same.
   - D: First decrease then increase.

7. **What is the speed of the electron if it is to be confined in a space of 10^{-10} m ? Mass of electron is $9 * 10^{-31}$ Kg.**

- A: $1.15 * 10^6$ m/s
- B: $3.42 * 10^6$ m/s
- C: $7.35 * 10^6$ m/s
- D: None of the above.

8. **The distance between atoms is 0.30nm. What will be the wavelength at an angle of 30 degrees for the first order of diffraction?**

- A: 0.60
- B: 0.30
- C: 0.20
- D: 0.90

9. **Uncertainity principle states that?**

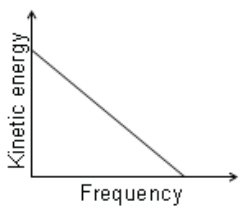
- A: Position and energy of a particle cannot be simultaneously measured with accuracy.
- B: Energy and momentum of a particle cannot be simultaneously measured with accuracy.
- C: Mass and energy of a particle cannot be simultaneously measured with accuracy.
- D: Position and momentum of a particle cannot be simultaneously measured with accuracy.

10. **Which of the following statements is not consistent with Bohr's set of postulates regarding the hydrogen atom model with regard to the emission and absorption of light?**

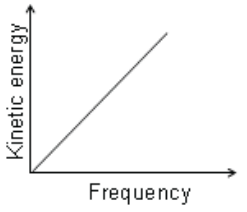
- A: Energy levels of the electrons are stable and discrete
- B:
An electrons emits or absorbs radiation only when making a transition from one energy level to another
- C:
To jump from a lower energy to a higher energy, an electron must absorbs photon of precisely the right frequency such that the photon's energy equals the energy difference between the two orbits
- D:
To jump from a higher energy to a lower energy, an electron absorbs a photon of a frequency such that photon's energy is exactly the energy difference between the two orbits

11. **According to Einstein's photoelectric equation, the graph between the kinetic energy of photoelectrons ejected and the frequency of incident radiation is?**

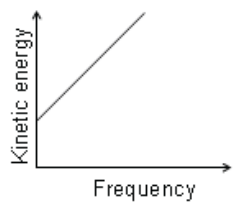
A



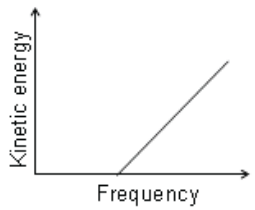
B



C



D



- A: A
- B: B
- C: C
- D: D

12. Maximum Kinetic Energy of electrons in the photo electric effect is?

- A: Proportional to the intensity of light.
- B: Proportional to the frequency of light.
- C: Independent of both intensity and frequency of light.
- D: Both A & B.

13. Photons A, B, C and D have wavelengths λ, 2λ, 3λ, 4λ. Which of the following is true about photons?

A has highest momentum
D has highest momentum
Momentum of A is four times that of D.

- A: I only
- B: II IIonly
- C: I and III only
- D: II and III only.

14. Rest mass of photon is?

- A: Zero
- B: Infinite
- C: Very small.
- D: Undetermined

15. Emission of radiation from radioactive substance is:

- A: Dependent on both temperature and pressure
- B: Independent of temperature but dependent on pressure
- C: Independent of both temperature and pressure
- D: Independent of pressure but dependent on temperature

16. Which of the following quantity / is increase for an object moving with speed approaching c?

Time

Length

Mass

- A: I only
- B: I and II only.
- C: I and III only
- D: I, II and III.

17. Which of the following is Planck's constant?

- A: $\lambda_{max} * T = 2.9 * 10^{-3}$ mK
- B: $h = 6.63 * 10^{-34}$ Js
- C: $c = 3 * 10^{8}$ m/s
- D: $\sigma = 5.67 * 10^{-8}$ $Wm^{-2}K^{-4}$

18. How many photons are released in the annihilation of electron and positron?

- A: 1
- B: 2
- C: 3
- D: Undetermined.

19. Sodium surface is successively illuminated by ultraviolet and visible radiations and the stopping potential is determined. This stopping potential is?

- A: Equal in both cases.
- B: More for ultraviolet.
- C: More for visible light.
- D: Varies randomly.

20. The anti-particle of electron is?

- A: Proton
- B: Neutron
- C: Positron
- D: Meson

ATOMIC SPECTRA

TEST-1

1. **The value of Rydberg's constant is?**

   - A: $1.0974 \times 10^{7}\ m^{-1}$
   - B: $1.0974 \times 10^{-7}\ m^{-1}$
   - C: 6.63×10^{-34} JS
   - D: -6.63×10^{-34} JS

2. **Laser beam can be used for?**

   - A: Welding of detached retinas.
   - B: Destroy tissues in a localized area.
   - C: Sealing off capillaries for the prevention of disease.
   - D: All of the above.

3. **Which of the following defines the excitation potential?**

   - A: Potential of electron in the first orbital.
   - B: Potential of electron in the orbital's greater than one.
   - C: Potential required taking a proton out of the nucleus.
   - D: Potential required lifting electron from ground state to some higher state.

4. **LASER is the acronym for?**

   - A: Linear Amplification by Standard Emission of Radiation
   - B: Light Amplification by Stimulated Emission of Radiation
   - C: Light Amplification by Series Emission of Radiation
   - D: Linear Amplification by Series Excitation of Radiation

5. **In X-ray tube, electrons after being accelerated through velocity v strike the target, then the wavelength of emitted X-rays is :**

   - A: Not greater than hc / eV
   - B: Not less than hc / eV
   - C: Equal to hc / eV
   - D: equal to h / mV

6. **Which one of the following is most coherent?**

   - A: X - rays
   - B: Normal light
   - C: y - rays
   - D: Laser

7. **Which of the following is same for the three spectral series in the infrared region?**

   - A: Frequency
   - B: Velocity
   - C: Wavelength
   - D: All of the above

8. In obtaining an x-ray phonographs of our hand, we use the principle of ?

- A: Photoelectric effect
- B: Ionization
- C: Shadow photograph
- D: Chromatography

9. In laser production, the state in which more atoms are in the upper state then in the lower one is called?

- A: Population inversion
- B: Normal state
- C: Meta stable state
- D: High energy state

10. When we excite some atoms by heat collusion or electrical charge, they will ?

- A: Radiate electromagnetic energy with a continuous distribution of wavelength.
- B: Radiate electromagnetic energy of discrete characteristic wavelength.
- C: Absorb particular wavelengths when white light is incident on them.
- D: Radiate electromagnetic energy as band of wavelengths.

11. The ionization energy of H - atom is ?

- A: 0 eV
- B: 13.6 eV
- C: - 13.6 eV
- D: 3.4 eV

12. Electron cannot exist in the nucleus, it is confirmed by observing that ?

- A: At does emit Y-radiation.
- B: Its size as compare to proton and neutron is very small.
- C: No antiparticle of electron is present.
- D: In order to do that the velocity of electron must be more than light according to uncertainty principle.

13. Wavelength of Balmer series is give by?

- A: $\frac{1}{\lambda} = R_h \left(\frac{1}{1^2} - \frac{1}{n^2} \right)$
- B: $\frac{1}{\lambda} = 1/R_h \left(\frac{1}{1^2} - \frac{1}{n^2} \right)$
- C: $\frac{1}{\lambda} = R_h \left(\frac{1}{2^2} - \frac{1}{n^2} \right)$
- D: $\frac{1}{\lambda} = 1/R_h \left(\frac{1}{3^2} - \frac{1}{n^2} \right)$

14. In He - Ne laser, the lazing action is produced by ?

- A: Ne only
- B: He - Ne combined.
- C: He only
- D: Either or them.

15. Laser is a device which can produce?

- A: An intense beam of light.
- B: Coherrent light.
- C: Monochromatic light.
- D: All of the above.

16. According to Bohr's theory the outer orbit Electron has _____energy than inner orbits ?

- A: Greater
- B: Smaller
- C: Equal
- D: Higher or lower (depending on the elements)

17. A white disk and a black disk are placed on top of a snow bank on a sunny day. The black disk sinks deeper into the snow because

- A: the black disk reflects light better.
- B: the white disk reflects light better.
- C: the black disk radiates heat better.
- D: the white disk radiates heat better.

18. The velocity of laser light is?

- A: Less than ordinary light.
- B: More than ordinary light.
- C: Equal to the ordinary light.
- D: Different for different colors of frequency.

19. In population inversion, atoms can reside in excited state for :

- A: 10^{-11}
- B: 10^{-8}
- C: 10^{-7}
- D: 10^{-3}

20. X-rays are ?

- A: Unknown in nature.
- B: High energy photons.
- C: High energy electrons.
- D: Radioisotopes.

TEST-2

1. **For the given choices, the photon of highest frequency will be absorbed when an electron jumps from ?**

   - A: 1^{st} to 5^{th} orbit
   - B: 2^{nd} to 5^{th} orbit
   - C: 3^{rd} to 5^{th} orbit
   - D: 4^{th} to 5^{th} orbit

2. **A hydrogen electron gains enough energy to rise from the n=1 to the n=5 energy level. How much energy does it gain?**

   $-.38eV$ _____ n=7

   $-.54eV$ _____ n=6

   $-.85eV$ _____ n=5

   $-1.25eV$ _____ n=4

   $-3.39eV$ _____ n=3

   $-13.6eV$ _____ n=1

   - A: $+.88eV$
   - B: $+2.54eV$
   - C: $+10.21eV$
   - D: $+12.75eV$

3. **If electron in the hydrogen atom moves to 5th shell from the higher shells, it releases which of the following series?**

   - A: Balmer series
   - B: Paschen series
   - C: Brackett series
   - D: Pfund series

4. **What is the order of wavelength of X-rays?**

   - A: 10^{-6} m
   - B: 10^{-10} m
   - C: 10^{-3} m
   - D: 10^{0} m

5. **The quantized energy of Bohr orbit of hydrogen atom is given by?**

   - A: $E_n = - n/E_o$
   - B: $E_n = - E_o/n$
   - C: $E_n = - E_o/\sqrt{n}$
   - D: $E_n = - E_o/n^2$

6. **Laser is an acronym for:**

   - A: Light annihilation by stimulated emission of radiation
   - B: Light amplification by stimulated emissions of radiations
   - C: Light amplitude of stimulated emissions of radiation
   - D: Light amplification by stimulated emission of radio

7. **Ground state energy of the 4^{th} orbital in a H-atom is ?**

   - A: - 13.60 eV
   - B: - 3.40 eV
   - C: -1.51eV
   - D: - 0.85 eV

8. 4200 volt is used in X-ray tube to accelerate the electrons to the speed of X-rays equal to?

- A: 2×10^8 m/s
- B: 3×10^8 m/s
- C: 2×10^7 m/s
- D: 3×10^9 m/s

9. Reflecting mirrors in lasers are used for which of the following purpose?

- A: Improve the life of the laser.
- B: Confine the emitted photons to stimulate further emission from other excited atoms.
- C: Improve frequency of the emitted light.
- D: All of the above.

10. Process of generating three dimensional images of the object is called?

- A: Photography
- B: 3-D cinema
- C: Holography
- D: Temography

11. X - rays can penetrate into a solid matter upto ?

- A: Several micrometers
- B: Several millimeters
- C: Several centimeters
- D: Several meters

12. Which of the following property must be there in a substance so that it can be used as target in X-ray tube?

- A: It must have low melting point
- B: It must have low atomic number
- C: It must have high atomic number
- D: It must have high reflecting ability

13. Wave like characteristic of electron is demonstrated by ?

- A: Line spectrum of atoms
- B: Diffraction by crystalline solids
- C: Production of X-rays
- D: Photo electric effect

14. What will be the energy of the accelerated electron used to produce X-rays when the accelerating potential is 2KV?

- A: 2×10^{19}J
- B: 1.6×10^{19}J
- C: 3.2×10^{19}J
- D: 3.2×10^{-16}J

15. If an electron in 'K' shell is removed and an electron from 'L' shell is jump to occupy the hole in 'K' shell, It emits a photon of energy:

- A: $hc=E_L-E_K$
- B: $h / c_{Ka} = E_L-E_K$
- C: $hf_{Ka}=E_L-E_K$
- D: $hf_{Ka}=E_K-E_L$

16. Laser light is monochromatic which means:

- A: It consists of one wavelength
- B: It consists of photons having 1 eV energy
- C: It consists of one ray of light
- D: It consists of carbon monoxide gas

17. A laser beam is:

- A: Non-coherent
- B: Mono-chromatic
- C: Both
- D: None

18. The meta stable state for an atom in laser light is?

- A: 10^{-3} sec
- B: 10^{-4} sec
- C: 10^{-5} sec
- D: 10^{-8} sec

19. Continuous spectra are an example of?

- A: Atomic spectrum
- B: Molecular spectrum
- C: Black body radiation
- D: None of the above

20. The kinetic energy K.E with which the electron strikes the target is given by:

- A: $K.E = hf^2$
- B: $K.E = eV$
- C: $K.E = e^2V$
- D: $K.E = hc/\lambda$

TEST-3

1. **If the radius of the first atomic orbital in the Bohr's model is 0.053 nm then the raidus of the third orbital is?**

   - A: 0.159 nm
   - B: 0.212 nm
   - C: 0.318 nm
   - D: 0.477 nm

2. **In the case when electrons loose all their energy in the first collision the X-ray photons emitted has which set of frequency and wavelength?**

   - A: $f_{min}\ \lambda_{min}$
   - B: $f_{min}\ \lambda_{max}$
   - C: $f_{max}\ \lambda_{min}$
   - D: $f_{max}\ \lambda_{max}$

3. **Brackett series is obtained when all transition of electron terminate on?**

   - A: 3rd orbit
   - B: 4th orbit
   - C: 5th orbit
   - D: 6th orbit

4. **Quality of X-rays depends upon?**

   - A: Filament current
   - B: Potential difference between the cathode and anode
   - C: Material of the target
   - D: Both A and B.

5. **In an X-ray tube, electrons each of charge 'e' are accelerated through the potential difference 'V' and allowed to hit a metal target, the maximum frequency of the X-rays emmited is ?**

   - A: hc/eV
   - B: he/Vc
   - C: eV/h
   - D: Impossible to predict

6. **As per the de-Broglie's interpretation of the Bohr's atomic model the speed of the orbital electrons?**

   - A: Is constant for all the orbitals.
   - B: Decreases in the higher orbitals.
   - C: Increases in the higher orbitals.
   - D: Depends on the mass of the nucleus.

7. Hydrogen atom do not emit x-rays because?

- A: Its energy level are too close to each other.
- B: Its energy level are too far apart.
- C: It is too small in size.
- D: It has a single electron.

8. The electric potential energy of an electron in an orbit at a distance from the positive charge is?

- A: $- Ke/r_n$
- B: $- ke/(r_n)^2$
- C: $- (ke)^2/r_n$
- D: $- ke^2/r_n$

9. For the priciple of population inversion during laser emission, which of the following statement is true?

- A: Electrons always remain in the metastable state.
- B: Electrons always remain in the ground state.
- C: Electrons stay longer in the excited state as compared to the metastable state.
- D: Electrons stay longer in the metastable state as compared to the excited state.

10. What is the velocity of a particle of mass m and de-Broglie Wavelength ?

- A: $h/m\lambda$
- B: $2h/m\lambda$
- C: $m\lambda/h$
- D: $m/h\lambda$

11. The minimum wavelength of X-rays can furhter be reduced by ?

- A: Reducing the pressure of cooling the target.
- B: Increasing the temperature of the filament.
- C: Using a target element of higher atomic number.
- D: Increasing the potential difference b/w the cathode and the anode.

TEST 4

1. **When X-rays are passed through successive aluminum sheets, what happens to their thickness ?**
   - A: It increases
   - B: It decreases
   - C: Remains same
   - D: Sometimes increases sometimes decreases

2. **Radiation with wavelength longer than red light is called?**
   - A: Ultraviolet rays
   - B: X-rays
   - C: Infrared radiations
   - D: Visible radiations

3. **Which of the following can be used to produce population inversion for the emission of laser?**
   - A: Optical fiber
   - B: Optical pumping
   - C: Optical instrument
   - D: Optical polarization

4. **X-rays are similar in nature to?**
   - A: Cathode rays
   - B: Beta rays
   - C: Gamma - rays
   - D: Alpha - rays

5. **The penetrating power of x-rays depend on their ?**
   - A: Applied voltage
   - B: Frequency
   - C: Source
   - D: All of the above

6. **In hydrogen spectrum, which one of the following series lies in the ultraviolet region ?**
   - A: Balmer series
   - B: Pfund series
   - C: Lyman series
   - D: Bracket series

7. Population inversion is the phenomena observed in?

- A: LASERs
- B: Balmer series
- C: compton Effect
- D: X-rays

8. A common He - Ne gas laser contain, He - Ne in the ratio?

- A: 80 - 20%
- B: 85 - 15%
- C: 70 - 30%
- D: 30 - 70 %

9. The radiations emitted from hydrogen filled discharge tube show?

- A: Band spectrum
- B: Line spectrum
- C: Continuous spectrum
- D: Absorption spectrum

10. Which of the following series has the highest frequency?

- A: Lyman series
- B: Balmer series
- C: Paschen series
- D: All have same frequency.

11. The value of Plank's constant is?

- A: 6.63×10^{-34} sec/J
- B: 6.63×10^{-34} J/sec
- C: 6.63×10^{-34} J.sec
- D: 6.63×10^{34} J/sec

12. Cathode rays are:

- A: Independent of the nature of gas.
- B: Dependent on the nature of gas.
- C: Depended on the target material.
- D: None of the above.

13. X-rays can be produced by bombardment of _____ on target metals:

- A: Electrons
- B: Protons
- C: Neutrons
- D: Alpha particles

14. Total number of series in hydrogen spectrum is?

- A: 3
- B: 4
- C: 5
- D: 6

15. The shortest wavelength of continuous X-ray, emitted from an X-ray tube, depends on:

- A: Current in tube
- B: Voltage applied
- C: Nature of tube
- D: Atomic number of target

16. The penetrating power of X-rays is comparable with that of ?

- A: α rays
- B: β rays
- C: γ rays
- D: None of the above.

NUCLEAR PHYSICS

TEST-1

1. **Which one of the following will be better shield against gamma rays ?**

   - A: Ordinary water
   - B: Heavy water
   - C: Lead
   - D: Aluminum

2. **Subatomic particles are divided into how many groups?**

   - A: 3
   - B: 4
   - C: 5
   - D: 6

3. **One a.m.u is equal to ?**

   - A: 1.66×10^{-27} kg
   - B: 1.66×10^{-25} kg
   - C: 1.66×10^{-20} kg
   - D: 1.66×10^{-19} kg

5. **Equivalent dose of radiation is defined as?**

   - A: $D_e = D / RBE$
   - B: $D_e = D * RBE$.
   - C: $D_e = D^2 * RBE$.
   - D: $D_e = D * RBE^2$.

6. **CFC is used in ?**

   - A: Refrigerator
   - B: Aerosol spray
   - C: Plastic foam industry
   - D: All of above

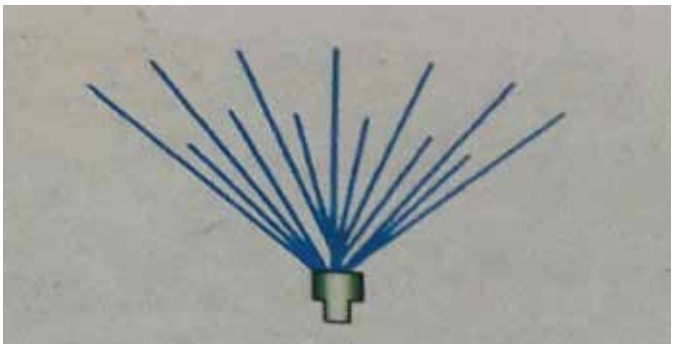
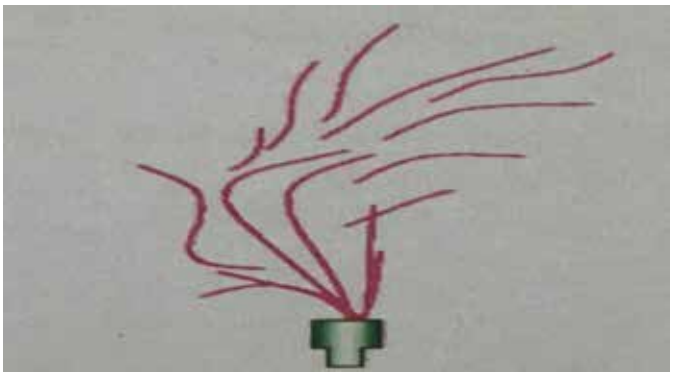
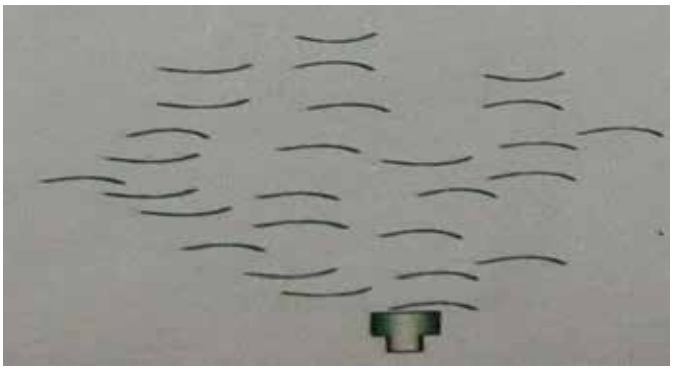
7. **Sum of the masses of constituent nucleons as compared to the mass of the resultant nucleus is ?**

   - A: Smaller
   - B: Greater
   - C: Same
   - D: Some times smaller some times greater

8. **Electrons can exist?**

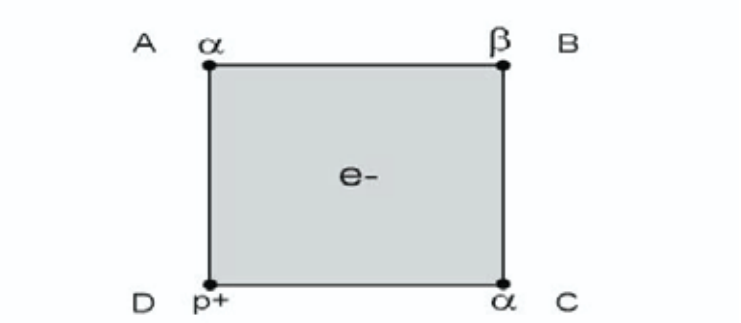
   - A: Inside the nucleus.
   - B: Cannot exist inside the nucleus.
   - C: Can exist both inside and outside the nucleus.
   - D: Electron existence inside or outside of nucleus depends on the isotope of the element.

4. In Wilson cloud chamber which of the following pattern represent beta particles?

- A: 
- B: 
- C: 
- D: All of the above

9. Mass of neutron is?

- A: 1.67×10^{-13} Kg
- B: 1.67×10^{-27} Kg
- C: 9.1×10^{-31} Kg
- D: 1.67×10^{-19} Kg



10. The two-dimensional cube in the diagram above has charged objects placed at the corners as shown. An electron that is free to move is placed at the exact center of the cube. In which direction will the electron move?

- A: It will move toward A.
- B: It will move toward B.
- C: It will move toward C.
- D: It will move toward D.

11. Mass defect is a phenomenon whereby?

- A: Mass of nucleus is greater than the total mass of individual nucleons.
- B: Mass of nucleus is less than the total mass of individual nucleons.
- C: Mass of nucleus is equal to the total mass of individual nucleons.
- D: Mass of nucleus is less than or equal to the total mass of individual nucleons depending on the properties of isotope.

12. The penetration power of beta-particle as compared to alpha-particle is ?

- A: 10 times more
- B: 100 times more
- C: 100 times less
- D: 10 times less

13. Average distance covered by alpha particles in a medium before coming to rest is called its?

- A: Ionization power.
- B: Limit.
- C: Decay potential
- D: Range

14. Which one of the following possesses highest penetrating power ?

- A: Alpha rays.
- B: Beta rays.
- C: Gamma rays.
- D: All of them have same penetrating power.

15. Unit of decay constant is?

- A: It has no units.
- B: Sv
- C: s
- D: s^{-1}

16. A particle having the mass of an electron and the charge of a proton is called?

- A: Antiproton
- B: Positron
- C: Gamma rays
- D: Photon

17. A carbon atom decays into a nitrogen atom in the equation below. Which of the quantities correctly finishes the equation?

$$^{14}_{6}\mathrm{C} \rightarrow ^{14}_{7}\mathrm{N} + ?$$

- A: Alpha
- B: Beta
- C: Gamma
- D: Neutron

18. Charge on alpha particle is?

- A: +1
- B: +2
- C: -2
- D: -1

19. Which of the following statements is correct?

- A: β-radioactivity is the process in which an electron is emitted from an unstable atom whose atomic number Z remains unchanged.
- B: ϒ-radioactivity is the process in which daughter nucleus has atomic number 1 unit more than that of parent nucleus.
- C: α-radioactivity is the process in which an unstable atom emits nucleus of helium atom.
- D: α -radioactivity is the process in which a heavy atom emits electromagnetic radiation of very high frequency.

20. How many major types of nuclear reactors are there?

- A: 2
- B: 3
- C: 4
- D: 5

TEST-2

1. **Which of the following is the device to detect isotopes?**

   - A: Wilson Cloud chamber
   - B: Geiger Muller counters
   - C: Solid state detector
   - D: Mass spectrograph.

2. **A half-life of sodium-24 is _____ which is used to estimate the volume of blood in a patient:**

   - A: 15 hours
   - B: 6 hours
   - C: 8 hours
   - D: 15 days

3. **A sample of a radioactive substance has a half-life of 20 minutes. If the sample's activity is 200 counts/second, what is the number of counts/second after one hour passes?**

   - A: 6.25 counts/sec
   - B: 12.5 counts/sec
   - C: 25 counts/sec
   - D: 50 counts/sec

4. **Nuclear force exists between?**

   - A: Proton-proton
   - B: Proton-Neutron
   - C: Neutron- Neutron
   - D: All of the above

5. **A certain nuclei of mass number "x" decays by β-emission and α-emission to a second nuclide of mass number "t" which of the following correctly relates "x" and "t" ?**

   - A: x = t-4
   - B: x = t +4
   - C: x + 3 = t
   - D: x-1 = t

6. **Candela is the luminous intensity, in the perpendicular direction of a surface _____ square meter of a black body at the temperature of freezing platinum under a pressure of 101325 Newton per square meter**

   - A: 1/300000
   - B: 1/600000
   - C: 1/200000
   - D: 1/500000

7. **Half life of Radon is?**

   - A: 1500 years
   - B: 23.5 mins
   - C: 3.8 days
   - D: 4×10^{789}

8. Which of the following radioactive isotope is used for studying blood isotopes?

- A: Carbon 14
- B: Cobalt 60
- C: Iodine 131
- D: Sodium 24

9. Sterlizations of surgical instrument, medical supplies and bandages can be done by exposing them to a beam of?

- A: a - rays
- B: b - rays
- C: y - rays
- D: "b" and "c" have equal antiseptic properties

10. In which of the following detectors impulse is independent of the energy of particle:

- A: GM counter
- B: Solid state
- C: Wilson cloud
- D: All of the above.

11. Moderators are used in Plutonium fission in order to?

- A: Slow down neutrons
- B: Speed up neutrons
- C: Create Alpha particles
- D: Control energy output.

12. For the radio therapy of patient it is required to double the absorbed dose in gray. What step should be taken?

- A: Energy must be quartered
- B: Energy must be halved
- C: Energy must be increased four times
- D: Energy must be doubled.

13. Besides Uranium 235 which other element is mostly used for the fission purpose?

- A: Barium 141
- B: Uranium 239
- C: Krypton 92
- D: Plutonium 239

14. Radio activity was discovered by?

- A: Marie Curie
- B: JJ Thomson
- C: Henri Becquerel
- D: S.A Wilson

15. Which of the following devices can be used for the fast counting of the radiation particles?

- A: Wilson Cloud chamber.
- B: Geiger-Muller counters
- C: Solid State detector.
- D: All of the above.

16. The safe radiation exposure limit for persons working in nuclear power station is ?

- A: 0.1 rem per week
- B: 1 rem per week
- C: 2 rem per week
- D: 3 rem per week

17. The binding energies for nuclei $_1H^1$, $_2He^4$, $_{26}Fe^{56}$, $_{92}U^{235}$ are 2.22, 28.3, 492 and 17.86 MeV respectively. The most stable nuclei is?

- A: $_1H^1$
- B: $_2He^4$
- C: $_{26}Fe^{56}$
- D: $_{92}U^{235}$

18. Range of the radiations depends on which of the following?

Charge and mass of the radiation particle

Density of medium

Ionization potential of atoms in the medium

- A: i only
- B: i and ii only
- C: ii and iii only
- D: i, ii and iii.

19. If M_0 is the mass of an oxygen isotope $_8O^{17}$, M_p and M_n are the masses of a proton and a neutron respectively, what is the nuclear binding energy of the isotope?

- A: $(M_0 - 8M)c^2$
- B: $(8M_p + 9M_n - M_o)c^2$
- C: $(M_o - 17M_n)c^2$
- D: M_oc^2

20. Among the three types of radioactive radiation, which have strongest penetration power?

- A: Alpha
- B: Gamma
- C: Beta
- D: Alpha, beta and gamma have same penetration

TEST-3

1. **Li nucleus has three protons and four neutrons. Mass of lithium nucleus is 7.016005 amu. Mass of proton is 1.007277 amu and mass of neutron is 1.008665 amu. Mass defect for lithium nucleus in amu is?**

   - A: 0.04002 amu
   - B: 0.04050 amu
   - C: 0.04065 amu
   - D: 0.04089 amu

2. **The bombardment of nitrogen with alpha particles produces oxygen and?**

   - A: Beta particle.
   - B: Alpha particle.
   - C: Neutron
   - D: Proton

3. **Iron is the most stable element because?**

   - A: It has highest binding energy.
   - B: It has lowest binding energy.
   - C: It has the highest number of neutrons in the nucleus.
   - D: Iron has shortest nuclei radius.

4. **According to the equation, ${}_{1}^{4}\mathrm{X} \rightarrow Y + 3\alpha$ what are atomic and mass numbers of "Y" ?**

   - A: Z-6 , A-12
   - B: Z-2, A-4
   - C: Z+1, A
   - D: Z+3, A

5. **A radioactive nucleus decays and emit following radiations in the sequence (i) alpha rays (ii) beta rays (iii) alpha rays and finally (iv) gamma radiation. If the atomic weight and the atomic number of the parent element A are 180 and 72 then, what will be the atomic number and atomic mass of the final element in the sequence?**

   - A: 70, 172
   - B: 69, 171
   - C: 69, 172
   - D: 68, 172

6. **What is equivalent radiation in Sv for a 20 rad source? RBE = 3.**

   - A: 0.006 Sv
   - B: 0.6 Sv
   - C: 6 Sv
   - D: 600 Sv

7. **Consider the following two statements A and B, and identify the correct answer.**

   A: In a nuclear reactor, cadmium rods are used to control the chain reaction, as cadmium slows down neutrons.
   B: In the pair production, a high energy gamma ray, while passing through the strong electric field of a nucleus gives rise to an particle and an antiparticle.

- A: Both are correct.
- B: Both are wrong.
- C: Only A is correct.
- D: Only B is correct.

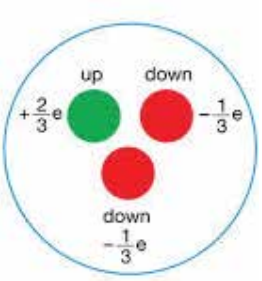
8. **Various types of cancer are treated by?**

- A: Cobalt 60
- B: Sodium 24
- C: Carbon 14
- D: Nickel 63

9. **In mass spectrograph, mass of each ion reaching the detector is proportional to?**

- A: $B/\sqrt{2}$
- B: B
- C: $\sqrt{2}B$
- D: B^2

10. **The following figure shows the quark model for which sub atomic particle?**



- A: Electron
- B: Proton
- C: Neutron
- D: None of the above.

11. **What is equivalent dose in rem for a 15 rad source? RME for the radiation is 5.**

- A: 0.075 rem
- B: 0.75 rem
- C: 75 rem
- D: 750 rem

12. **For a chain reaction to buildup, the radioactive mass should be ?**

- A: Less than the critical mass.
- B: Greater than the critical mass.
- C: Equal to critical mass.
- D: Greater than or equal to the critical mass.

13. The dead time of Geiger Muller counter is of the order of ?

- A: 10^{-1} s
- B: 10^{-2} s
- C: 10^{-3} s
- D: 10^{-4} s

14. In a sample of radioactive material, what fraction of the initial number of active nuclei will remain undisintegrated after half of a half-life of the sample?

- A: 1/2
- B: 1/4
- C: $1/2\sqrt{2}$
- D: $1/\sqrt{2}$

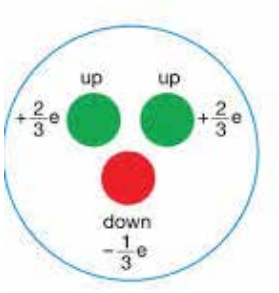
15. Which of the following is true about the strong nuclear force ?

- A: It increase with magnitude of increasing charge
- B: It decrease with magnitude of increasing charge
- C: Is independent of charge
- D: Only works between proton-proton pair.

16. Which of the following is the correct relationship between the intensity of gamma radiations (X) and distance from the source (D)?

- A: $X \alpha 1/D$
- B: $X \alpha 1/\sqrt{2}D$
- C: $X \alpha 1/D^2$
- D: None of the above.

17. The following figure shows the quark model for which sub atomic particle?



- A: Proton
- B: Electron
- C: Neutron
- D: Baryon

18. The radioactive decay of an element X into elements Y and K is represented by the equation:

$_{z}X^{A} \rightarrow {}_{z-2}A^{A-4} \rightarrow {}_{z-2}A^{A-4} \rightarrow {}_{z-1}C^{A-4}$

The sequence of the emitted radiations is?

- A: α, β and ϒ
- B: β, ϒ and α
- C: α, ϒ and β
- D: ϒ, α and β

19. Activity of a radioactive sample decreases to (1/3)rd of its original value in 3 days. Then, in 9 days its activity will reduce to?

- A: 1/3 of the original value.
- B: 1/9 of the original value.
- C: 1/18 of the original value.
- D: 1/27 of the original value.

20. The nucleus $_{92}U^{234}$ splits exactly in half, in a fission reaction, in which two neutrons are released. The resultant nuclei are?

- A: $_{46}X^{116}$
- B: $_{46}X^{117}$
- C: $_{44}X^{116}$
- D: $_{44}X^{117}$

TEST-4

1. **Which of the following basic forces is short range?**

   Weak nuclear forces

   Strong nuclear forces

   Gravitational force

   - A: i only
   - B: iii only
   - C: i and ii only
   - D: ii and iii only

2. **The half life of radioactive element is 1500 years, the fraction of sample that is left after 6000 years is?**

   - A: 1/2
   - B: 1/4
   - C: 1/8
   - D: 1/16

3. **A mass spectrograph sorts out?**

   - A: Molecules
   - B: Ions
   - C: Elements
   - D: Isotopes

4. **The energy obtained in a nuclear reaction is derived from**

   - A: mass defect and binding energy.
   - B: fission.
   - C: fusion.
   - D: all of these.

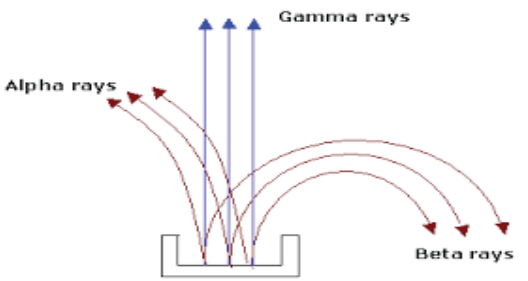
5. **Which of the following radioactive element is used as tracer in the plants?**

   - A: Carbon 12
   - B: Carbon 14
   - C: Cobalt 60
   - D: Iodine 131

6. **Emission of alpha decay from a radioactive substance causes:**

   - A: Decrease in 'Z' by 4 and decrease in 'A' by 2.
   - B: Decrease in 'A' by 1 and 'Z' remain same.
   - C: Decrease in 'Z' by 1 and 'A' remains same.
   - D: Decrease in 'A' by 4 and decrease in 'Z' by 2.

7. **In a radioactive phenomenon observation shown in the figure where α deaviates lesser than β in some electric or magnetic fields (not shown in figure). What is the reason of less deviation of α?**



   - A: α is charged particle
   - B: α is neutral particle
   - C: α is lighter particle
   - D: α is heavier particle

8. **Half life of four elements is given as A: 12 hours; B: 5 days; C: 3 years; D: 18 years. Which one of them has highest decay constant?**

- A: A
- B: B
- C: C
- D: D

9. **In cloud chamber , the path of β-particles is:**

- A: Straight, thick, short
- B: Thin, wavy, shorter
- C: Thin, wavy, longer
- D: Thin, wavy, short

10. **Radioactive materials can be identified by measuring their?**

- A: Hardness
- B: Density
- C: Half Life
- D: All of the above.

11. **Charge on an electron was first determined by?**

- A: Ampere
- B: Maxwell
- C: Milliken
- D: Thomson

12. **Which of the following is the unit of absorbed dose?**

- A: Gray
- B: Severt
- C: Roentgen
- D: Curie

13. **A radioactive substance disintegrates for 4 hrs and its $1/16^{th}$ part remains undisintegrated. What will be the half life of the element?**

- A: 0.5 hrs
- B: 1 hr
- C: 2 hrs
- D: 4 hrs

14. **Isotopes of the same element have?**

- A: Different number of electrons.
- B: Different number of protons.
- C: Different number of neutrons.
- D: Different chemical properties.

15. Average energy required to break up a nucleus is?

- A: Greater than the energy released by the mass defect during its formation.
- B: Less than the energy released by the mass defect during its formation.
- C: Equal to the energy released by the mass defect during its formation.
- D: Could be greater or less than the energy released by the mass defect during its formation.

16. Radio isotopes can be made easily by the bombardment with ?

- A: Electrons
- B: Protons
- C: Neutrons
- D: All of the above.

17. If 200 MeV energy is released in the fission of a single nucleus of $_{92}U^{235}$, how many fissions must occur per second to produce a power of 1 kW?

- A: $3.12 * 10^{13}$
- B: $2.81 * 10^{15}$
- C: $4.38 * 10^{15}$
- D: $8.42 * 10^{17}$

18. An element $_{86}R^{220}$ decays to a new element S by emitting two alpha-emissions, the nuclide S is ?

- A: $_{84}S^{212}$
- B: $_{82}S^{212}$
- C: $_{80}S^{220}$
- D: $_{84}S^{216}$

19. If A is mass number and Z is the atomic number then mass defect is given by? m_p and m_n are the mass of the proton and neutron respectively.

- A: $\Delta m = Zm_p + (A\text{-}Z)m_n - M_{nucleus}$
- B: $\Delta m = Zm_p + (A + Z)m_n - M_{nucleus}$
- C: $\Delta m = Zm_p + (A\text{-}Z)m_n + M_{nucleus}$
- D: $\Delta m = Zm_p - (A+Z)m_n + M_{nucleus}$

20. Which one of the following has largest energy content?

- A: Gamma rays
- B: X rays
- C: Infrared rays
- D: UV radiations